REMARKS

Reconsideration and allowance of the above-referenced application are respectfully requested.

Initially, Applicants gratefully acknowledge the Examiner's detailed comments and suggestions on the specification and the figures. Applicants will correct each informality or inconsistency of the specification and figures to comply with the Examiner's requirement at a later time. This response is to address the rejections to claims.

Claims 17-20 are canceled to obviate the rejections thereto. Claims 36-39 are newly added to the subject matter fully disclosed in the original specification. For example, Claim 36 is supported by Figure 14; Claim 37 is supported by the description in line 21, page 43 to line 2, page 44 of the specification. Hence, no new matter is added.

In Claim 1, the language "substantially inhibit" is deleted from Claim 1 to obviate the rejections under 35 USC 112, second paragraph. The limitations of "well layers of one quantum well structure including GaAs and well layers of another quantum well structure including InGaAs" are deleted and are now in new Claim 38.

Attached is a marked-up version of the changes being made by the current amendment.

Turning to rejections based on prior art, Liu '421 is cited as allegedly anticipating Claims 1 and 16. Applicants respectfully traverse this contention.

Liu discloses that each quantum well has its first excited state close to the top of the barrier (Column 1, lines 57-58). In particular, Liu defines the "closeness" in Column 3, lines 26-29 as "a difference in energy less then[sic] 20 meV" (emphasis added). Hence, Liu teaches a difference between the excited state and the top of the barrier.

In stark contrast, Claim 1 recites an entirely different quantum well structure in which "said excited energy state is substantially resonant with an energy of the well top" (emphasis added). Such an excited state is a new quantum state "quai bond" state for detecting IR radiation. Nothing in the cited Liu suggests such. Liu, in fact, teaches away from this resonance with the top of the well by requiring "a difference in energy" between the excited state of the quantum well and the top of the barrier.

Therefore, it is respectfully suggested that Lin fails to teach each limitation of Claim 1. Accordingly, Claim 1 in its current form is distinctly different from Liu and thus is patentable over Liu under 35 USC 102(a).

Claims 1 and 11-13 also stand rejected under 35 USC 103(a) over Tsai in view of Liu. Tsai discloses a quantum transition from a bound state to quasicontinuum (QC) state (right column on page 3504). A QC state is a weakly bound quantum state and is not resonant with the top of the well. In contrast, Claims 1 and 11-13 recite an excited state that is "substantially resonant with an energy of the well top." Hence, the combination of Tsai and Liu fails to teach each limitation of Claims 1 and 11-13. Therefore, the rejections should be withdrawn.

Similarly, the rejections based on Liu, or Liu and Tsai in view of Bethea should be withdrawn based on the above arguments. The cited references, when viewed as a whole, fail to teach the quasibond excited state that is "substantially resonant with an energy of the well top."

The new claims 36-39 are dependent on the base Claim 1 and hence are patentable based on the above arguments. In addition, Claims 36-39 are patentable based on their own merits. For example, the cited art fail to disclose in the limitations in new Claims 36 and 37.

In summary, all pending claims are distinctly different from the cited art and are patentable. All rejections should be withdrawn.

A notice of appeal is filed herewith to keep the present case pending. Enclosed is a $620 check for the Three Month Extension of Time for the delay in filing this response and for filing the notice of appeal. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Version with markings to show changes made

In the claims:

Claims 17-20 have been cancelled and other claims have been amended as follows:

1. (Amended) A quantum well infrared photodetector (QWIP) comprising:

a substrate formed of a semiconductor material; and

a plurality of photodetectors disposed relative to one another to form an array on said substrate, each photodetector having [two] first and second quantum well structures, one stacked over the other and each comprising a plurality of alternating barrier layers and well layers, each well layer of each quantum well structure coupled between two barrier layers to support an intersubband transition between a bound ground energy state and an excited energy state within a common energy band where said excited energy state is substantially resonant with an energy of the well top, [and said barrier layers are sufficiently thick to substantially inhibit carrier tunneling therethrough;]

wherein [the] materials, thicknesses and dimensions of said well layers and barrier layers are selected such that said first and said second quantum well structures effect intersubband transitions at first and second wavelengths, respectively, [well layers of one quantum well structure including GaAs and well layers of another quantum well structure including InGaAs,] wherein none of said two quantum well structures is short circuited.

3. A QWIP as in claim 1 wherein said two quantum well structures in each photodetector are separated by an intermediate contact layer.

4. A QWIP as in claim 3 wherein said barriers in both quantum well structures are formed of $Al_xGa_{1-x}As$.

9. The QWIP as in claim 1 further comprising a multiplexer coupled to each photodetector in said array and generating a stream of data caused by radiation at said first wavelength and a stream of data caused by radiation at said second wavelength, so as to separately form images of the first and second wavelengths.

11. A QWIP as in claim 1 further comprising a continuum transport band, carrying a photocurrent from said wells, wherein the continuum transport band has a smooth energy level profile between wells in said two quantum well structures.

12. A QWIP as in claim 11 wherein said barriers in one of said two quantum well structures have a barrier height equal to that of the barriers in the other one of said two quantum well structures.

13. A QWIP as in claim 12 wherein each barrier is formed of a material including aluminum, wherein the aluminum mole ratio is the same for the barriers in both quantum well structures.

14. (Amended) A [photodetector] QWIP as in claim 1 further comprising a random reflector formed on said substrate to reflect incident radiation to said photodetectors.

15. A QWIP as in claim 1 wherein said barrier layers are made of $Al_xGa_{1-x}As$, and said second group of wells are formed of $Al_yGa_{1-y}As$ where x is not equal to y.

16. (Amended) A [photodetector] QWIP as in claim 1 wherein said excited energy state is substantially resonant with an energy of the well top and has a deviation from said well top by less than about 2% of the well top.